

Remediation Status and Compliance Summary

This chapter provides a summary of CERCLA remediation activities in 2000 for each project, and summarizes compliance activities with other applicable environmental laws, regulations, and legal agreements. CERCLA is the primary driver for environmental remediation of the FEMP.

The EPA and OEPA enforce the environmental laws, regulations, and legal agreements governing work at the FEMP. The EPA develops, promulgates, and enforces environmental protection regulations and technology-based standards. EPA regional offices and state agencies enforce these regulations and standards by review of data collected at the FEMP. Region V of the EPA has regulatory oversight of the CERCLA process at the FEMP, with active participation from OEPA.

For some programs, such as those under the Resource Conservation and Recovery Act (RCRA), as amended, the Clean Air Act, as amended (excluding NESHAP compliance), and the Clean Water Act, as amended, EPA has authorized the State of Ohio to act as the primary enforcement authority. For these programs, Ohio promulgates state regulations that must be at least as stringent as federal requirements. Several legal agreements between DOE and EPA Region V and/or OEPA identify FEMP specific requirements for compliance with the regulations. As part of complying with these regulations, DOE Headquarters issues directives to its field and area offices and conducts audits to ensure compliance with all regulations.

CERCLA Remediation Status

The process for remediating sites under CERCLA consists of three phases, site characterization, remedy selection, and implementation. The FEMP has completed the first two phases, as the regulatory agencies have now approved remedy selection documents (i.e., Records of Decision) for all operable units. The Record of Decision Amendment for Operable Unit 4 Silos 1 and 2 Remedial Actions (DOE 2000a) was approved by the regulatory agencies in June of 2000.

The FEMP is currently involved in the implementation phase of CERCLA remediation, which includes remedial design, remedial action (construction and implementation of the remedy), certification of soil and groundwater to verify that the remedy was effective, and ultimately, site closure. Remediation activities, documents, and schedules are identified in each operable unit's remedial design and remedial action work plan. Progress has been made toward certification of soil remediation areas, as the Soil and Disposal Facility Project certified several more areas during 2000, as described later in this chapter under the Soil and Disposal Facility Project section.

Each phase of the CERCLA remediation process requires documentation. The documents produced reflect the input of stakeholders who have helped form the remediation strategy at the FEMP. Many documents that describe specific remediation activities were issued and/or approved in 2000, as mentioned throughout this report and identified in Table 2-1. All clean-up related CERCLA documentation is available to the public at the Public Environmental Information Center located near the FEMP. The administrative record is located at EPA's Region V office in Chicago, Illinois. The progress made by each remedial project toward CERCLA cleanup is summarized later in this chapter.

TABLE 2-1
MAJOR FEMP DOCUMENTS FOR 2000

Project ^a	Documents	Status (on December 31, 2000)
Soil and Disposal Facility Project	Permanent Leachate Transmission System – Conceptual Design Report	Approved by Regulatory Agencies
	On-Site Disposal Facility Borrow Area Strategy Report	Approved by Regulatory Agencies
	90 Percent Title I/II Design for Areas 3A/4A	Submitted to Regulatory Agencies
	Certification Report for Area 2, Phase 3 Part 2	Approved by Regulatory Agencies
	Area 8, Phase III South Certification Report	Approved by Regulatory Agencies
	Certification Report for Area 1, Phase II	Submitted to Regulatory Agencies
Natural Resources	FEMP Master Plan for Public Use	Approved by Regulatory Agencies
	Area 8, Phase II Natural Resource Restoration Design Plan	Approved by Regulatory Agencies
Demolition Projects	Interim Report on D&D of Maintenance/Tank Farm Structures	Approved by Regulatory Agencies
	Operable Unit 3 Miscellaneous Small Structures D&D Project, Task Order #464 Completion Report	Submitted to Regulatory Agencies
Silos Project	Remedial Design Work Plan for the Silos 1 & 2 Accelerated Waste Retrieval Project	Approved by Regulatory Agencies
	Revised Feasibility Study Report for Silos 1 & 2	Approved by Regulatory Agencies
	Revised Proposed Plan for Remedial Actions at Silos 1 & 2	Approved by Regulatory Agencies
	Remedial Design Work Plan Silos 1 & 2 Accelerated Waste Retrieval Project Site Preparation	Submitted to Regulatory Agencies
	Silos 1 & 2 Accelerated Waste Retrieval (AWR) Project Remedial Design Package	Submitted to Regulatory Agencies
	Remedial Design Work Plan for Operable Unit 4 Silos 1 & 2	Approved by Regulatory Agencies
	Record of Decision Amendment for Operable Unit 4 Silos 1 & 2 Remedial Actions	Approved by Regulatory Agencies
Aquifer Restoration and Wastewater Project	Monthly Re-Injection Operation Reports	Submitted to Regulatory Agencies
	NPDES Discharge Monitoring Reports	Submitted to Regulatory Agencies
	Conceptual Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas	Submitted Informally to Regulatory Agencies
	Re-Injection Demonstration Test Report for the Aquifer Restoration and Wastewater Project	Approved by Regulatory Agencies
Environmental Monitoring	Integrated Environmental Monitoring Quarterly Status Reports	Submitted to Regulatory Agencies
	1999 Annual Integrated Site Environmental Report	Submitted to Regulatory Agencies
	Integrated Environmental Monitoring Plan, Revision 2, Draft Final	Submitted to Regulatory Agencies

^aNo major documents were submitted by the Waste Pits Remedial Action Project in 2000.

CERCLA also requires a five-year review process of remedial actions implemented under the signed Record of Decision for each operable unit. The purpose of a five-year review is to determine whether the selected remedy at a site remains protective of human health and the environment through evaluation of performance of the remedy. The First Five-Year Review Report for the FEMP (DOE 2001a) was submitted to the EPA in April of 2001.

Cleanup levels for the FEMP for surface water, sediment, and groundwater were established in the Record of Decision for Remedial Actions at Operable Unit 5 (DOE 1996). These final remediation levels (FRLs) were established for constituents of concern, or those constituents at the FEMP determined, through risk assessment, to present risk to human health and/or the environment. Table 2-2 lists FRLs identified for constituents in groundwater, surface water, and sediment; these constituents are all monitored under the IEMP. FRLs represent the maximum allowable residual levels (the maximum concentrations which may remain in the environment following remediation), and these levels drive excavation and cleanup.

Benchmark Toxicity Values originated from the Operable Unit 5 Sitewide Ecological Risk Assessment. These concentrations for sediment and surface water are used to determine if a constituent may have a detrimental effect on a particular ecological receptor. For surface water and sediment, ecological receptors include fish and animals that inhabit the surface water body or use surface water as a source of drinking water.

Acceptable levels for constituents of ecological concern were established in the Operable Unit 5 Sitewide Ecological Risk Assessment (Appendix B of the Operable Unit 5 Remedial Investigation Report). The Sitewide Ecological Risk Assessment established benchmark toxicity values (BTVs) for protection of ecological receptors. Through the BTV screening process presented in Appendix C of the Final Sitewide Excavation Plan (DOE 1998b), three constituents of ecological concern (barium, cadmium, and silver) were selected to be evaluated in the surface water pathway to be protective of aquatic receptors. Chapter 4 discusses BTVs for surface water.

TABLE 2-2
FINAL REMEDIATION LEVELS
FOR GROUNDWATER, SURFACE WATER, AND SEDIMENT

Constituent	FRL ^a		
	Groundwater	Surface Water	Sediment
General Chemistry	(mg/L)	(mg/L)	(mg/kg)
Cyanide	NA ^b	0.012	NA
Fluoride	4 ^c	2.0	NA
Nitrate ^d	11	2,400	NA
Inorganics	(mg/L)	(mg/L)	(mg/kg)
Antimony	0.0060	0.19	NA
Arsenic	0.050	0.049	94
Barium	2	100	NA
Beryllium	0.0040	0.0012	33
Boron	0.33	NA	NA
Cadmium	0.014	0.0098	71
Chromium VI ^d	0.022	0.010	3,000
Cobalt	0.17	NA	36,000
Copper	1.3	0.012	NA
Lead	0.015 ^c	0.010	NA
Manganese	0.900	1.5	410
Mercury	0.0020	0.00020	NA
Molybdenum	0.10	1.5	NA
Nickel	0.10	0.17	NA
Selenium	0.050	0.0050	NA
Silver	0.050	0.0050	NA
Thallium	NA	NA	88
Vanadium	0.038	3.1	NA
Zinc	0.021	0.11	NA
Radionuclides	(pCi/L)	(pCi/L)	(pCi/g)
Cesium-137	NA	10	7.0
Neptunium-237	1.0	210	32
Lead-210	NA	11	390
Plutonium-238	NA	210	1,200
Plutonium-239/240	NA	200	1,100
Radium-226	20	38	2.9
Radium-228	20	47	4.8
Strontium-90	8.0	41	7,100
Technetium-99	94	150	200,000
Thorium-228	4.0	830	3.2
Thorium-230	15	3500	18,000
Thorium-232	1.2	270	1.6
	(µg/L)	(µg/L)	(mg/kg)
Total Uranium ^e	20	530	210

**TABLE 2-2
(Continued)**

Constituent	FRL ^a		
	Groundwater	Surface Water	Sediment
Organics	(µg/L)	(µg/L)	(µg/kg)
Alpha-chlordane	2.0	0.31	NA
Aroclor-1254	0.20	0.20	670
Aroclor-1260	NA	0.20	670
Benzene	5.0	280	NA
Benzo(a)anthracene	NA	1.0	190,000
Benzo(a)pyrene	NA	1.0	19,000
Benzo(b)fluoranthene	NA	NA	190,000
Benzo(k)fluoranthene	NA	NA	1,900,000
Bis(2-chloroisopropyl)ether	5.0	280	NA
Bis(2-ethylhexyl)phthalate	6.0	8.4	5,000,000
Bromodichloromethane	100	240	NA
Bromoform	NA	NA	160,000
Bromomethane	2.1	1300	NA
Carbazole	11	NA	63,000
Carbon disulfide	5.5	NA	NA
Chloroethane	1.0	NA	NA
Chloroform	100	79	NA
Chrysene	NA	NA	19,000,000
Dibenzo(a,h)anthracene	NA	1.0	NA
3,3'-Dichlorobenzidine	NA	7.7	NA
1,1-Dichloroethane	280	NA	NA
1,1-Dichloroethene	7.0	15	NA
1,2-Dichloroethane	5.0	NA	NA
Dieldrin	NA	0.020	NA
Di-n-butylphthalate	NA	6,000	NA
Di-n-octylphthalate	NA	5.0	NA
Methylene chloride	5.0	430	NA
4-Methylphenol	29	2,200	NA
4-Methyl-2-pentanone	NA	NA	2,100,000
4-Nitrophenol	320	7,400,000	NA
N-nitrosodiphenylamine	NA	NA	260,000
Octachlorodibenzo-p-dioxin	0.0001	NA	NA
Phenanthrene	NA	NA	3
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.010	NA	NA
Tetrachloroethene	NA	45	NA
1,1,1-Trichloroethane	NA	1.0	NA
1,1,2-Trichloroethane	NA	230	NA
Trichloroethene	5.0	NA	NA
Vinyl Chloride	2.0	NA	NA

^aFrom Record of Decision for Remedial Actions at Operable Unit 5, Tables 9-4 through 9-6, January 1996

^bNA = not applicable because no FRL was required for this constituent in this particular environmental media.

^cThe groundwater FRLs for fluoride and lead were changed from 0.89 mg/L and 0.002 mg/L, respectively, to be consistent with the FRL selection process outlined in the Operable Unit 5 Feasibility Study. The changes were documented in the Operable Unit 5 Record of Decision by change pages.

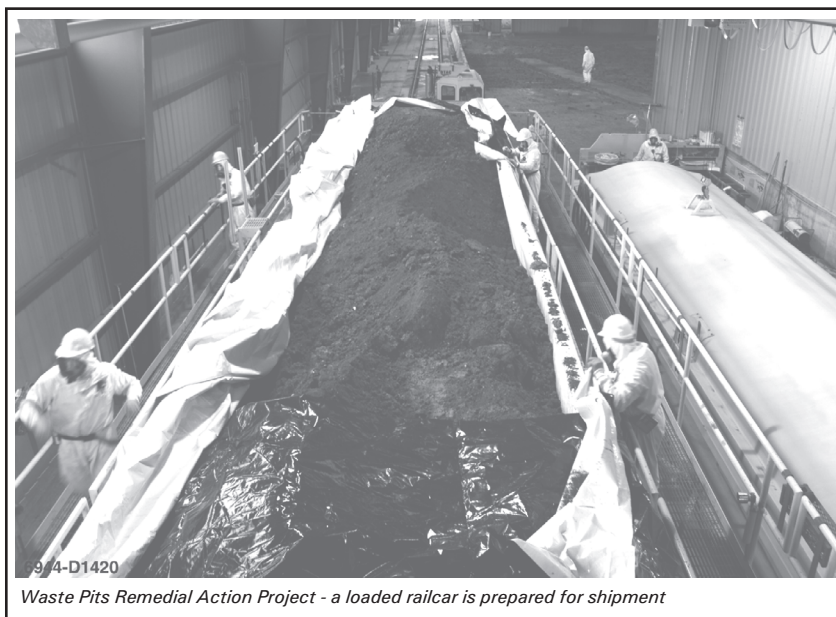
^dBecause of holding time considerations, nitrate/nitrite is analyzed for nitrate and total chromium is analyzed for hexavalent chromium. This is acceptable because total chromium and nitrate/nitrite provide a more conservative result.

^eUranium consists of several isotopes. The common isotopes of uranium include uranium-234, uranium-235, uranium-236, and uranium-238. This report interchangeably uses the terms uranium and total uranium. Either of these terms is defined as the sum of the various isotopic components.

Waste Pits Remedial Action Project

The Waste Pits Remedial Action Project (Operable Unit 1) is responsible for the excavation, drying (as required), loading, and rail transport of the contents of waste pits 1 through 6, the burn pit, and the clearwell to an off-site disposal facility. Sampling and analysis of the waste pit material and the off-site disposal of contaminated soil and debris that exceed the waste acceptance criteria (physical, chemical, and radiological standards) for the on-site disposal facility is part of this scope of work. The project is also responsible for collecting wastewater and storm water associated with the Waste Pits Remedial Action Project activities and, as needed, pre-treating and transporting this remediation water to the advanced wastewater treatment facility. In addition, the project is responsible for implementing dust control measures, and for implementing point source emission controls for dryer operations.

IT Corporation, the subcontractor for the Waste Pits Remedial Action Project, is responsible for the pre-treatment (e.g., crushing, sorting, and shredding) of waste pit materials, drying (as necessary), and the loadout of railcars with pit material for shipment to Envirocare of Utah, Inc. During 2000, 16 trains left the FEMP carrying a total of 104,209 tons (94,538 metric tons) of material. Since the first rail shipment in April of 1999, the Waste Pits Remedial Action Project has shipped 32 trains carrying approximately 193,836 tons (175,848 metric tons) of material to Envirocare of Utah, Inc. for disposal. As of December 31, 2000, the excavation of the waste pits was approximately 30 percent complete.

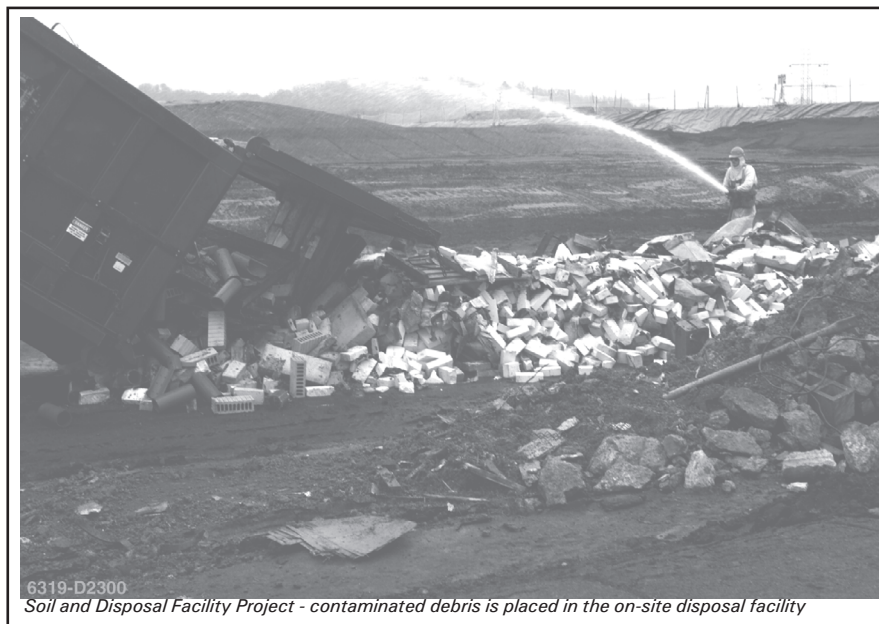


Soil and Disposal Facility Project

The Soil and Disposal Facility Project, which includes components of both Operable Units 2 and 5, is responsible for soil characterization sampling, excavation of contaminated soil, natural resource restoration, and the construction of on-site disposal facility cells and waste placement into those cells. Of note, the on-site disposal facility's leachate and leak detection monitoring, as well as operation, maintenance and monitoring of the leachate transmission system is the responsibility of the Aquifer Restoration Project.

For purposes of excavating contaminated soil, the FEMP has been divided into 10 main soil remediation areas. Figure 2-1 depicts Remediation Areas 1 through 9. Area 10, which is not shown on Figure 2-1, consists of potentially contaminated corridors such as haul routes, utility corridors and access roads. Area 10 will not be addressed until the end of both soil and aquifer remediation.

Prior to remediation, real-time scanning and soil sampling are performed to support engineering designs to determine the extent of contaminated soil for remediation, and to identify the materials that meet the waste acceptance criteria for the on-site disposal facility. Materials that cannot be placed in the on-site disposal facility are stockpiled, monitored, and tracked for off-site disposal. When contaminated soil and debris have been excavated from each area, pre-certification real-time scanning and certification sampling are performed to demonstrate that the residual levels of the constituents of concern for that area are below the site's FRLs. After the laboratory results are reviewed to confirm that constituents of concern are below the site's FRLs, the area is certified as meeting the soil remediation goal, and natural resource restoration can begin.



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Soil and Disposal Facility Project - contaminated debris is placed in the on-site disposal facility

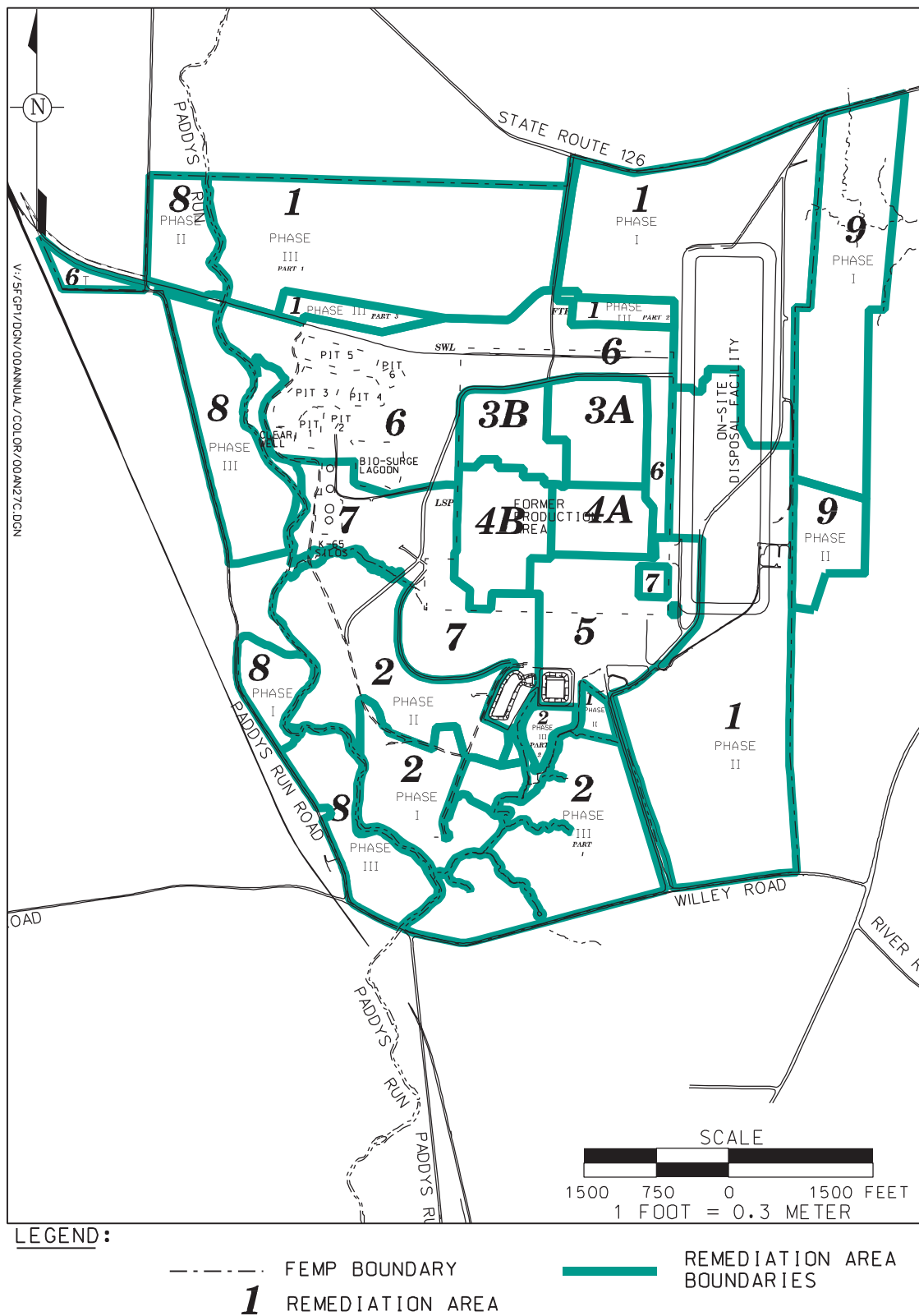


Figure 2-1. Sitewide Remediation Areas

The Soil and Disposal Facility Project continued soil and debris excavation and placement in 2000. Soil excavation and/or certification activities took place in the following remediation areas in 2000:

- Area 1, Phase II (former sewage treatment plant, trap range, additional area and facilities in the southeast corner of the FEMP): In 1999 soil in the vicinity of the former trap range was treated to stabilize the lead, and as a result, allow the soil to be placed in the on-site disposal facility. In 2000 a small volume (4 cubic yards [yd³]) (3 cubic meters [m³]) of soil required further lead stabilization and excavation. After certification sampling and analysis took place in this area, the Certification Report for Area 1, Phase II was submitted to the EPA and OEPA. Also, clay to be used as on-site disposal facility liner material was stockpiled in the borrow area.
- Area 1, Phase III (areas north of the former production area and the waste pits): Part 1 includes the 100-plus acre (40.5 hectare) area north of the production area and waste pits. Certification sampling and analysis in Area 1, Phase III, Part 1 took place during the spring of 2000. Also, a ground penetrating radar scan took place in portions of this area to identify any buried man-made materials. A certification report will be issued in 2001 after removal of some identified construction debris, and subsequent certification of that soil. Part 2 is the 7-acre (2.8-hectare) field north of the railyard and east of the former fire training facility. Pre-certification scanning and certification sampling were conducted in the summer of 2000 for Part 2. A small remedial excavation was required to remove 625 yd³ (478 m³) of contaminated soil adjacent to the former fire training facility.
- Area 2, Phase I (southern waste units, southwest corner of the FEMP): Excavation and real-time radiological monitoring of the South Field and the Active Flyash Pile continued during 2000, and the excavation reached the design grade. A ground penetrating radar scan was performed in an area adjacent to the southern waste units, and 10,000 yd³ (7,650 m³) of material were excavated to remove all identified man-made objects. Excavation took place to remove approximately 5,000 yd³ (3,800 m³) of radium contaminated soil from Area 2, Phase III, Part 2, just south of the Storm Water Retention Basin. Soil Pile 3 was also excavated in 2000.
- Areas 3, 4, and 5 (former production area): The 90 Percent Title I/II Design for Areas 3A/4A was submitted to EPA and OEPA.
- Area 6 (waste pits area): No Soil and Disposal Facility Project activities took place in Area 6 during 2000.
- Area 7 (Silos Project area and advanced wastewater treatment facility vicinity): Soil sampling to determine attainment of on-site disposal facility waste acceptance criteria was completed in support of soil excavations that took place in the vicinity of the silos (Operable Unit 4) for the project's infrastructure development.
- Area 8 (west of Paddys Run): Area 8, Phase III-South (the southwestern corner of the site) was certified, and the certification report was approved by the regulatory agencies. No excavation of this area was required.
- Area 9 (off-property soil adjacent to the FEMP): Area 9, Phase I includes off-property soil adjacent to remediated portions of Area 1, Phase I. Real-time scanning and soil sampling was performed in 2000 within Area 9, Phase I in preparation for the certification of this area. Also, additional subsurface background soil samples were collected from off-property areas north and east of the FEMP to fill the data gap in the 1992 soil background study.

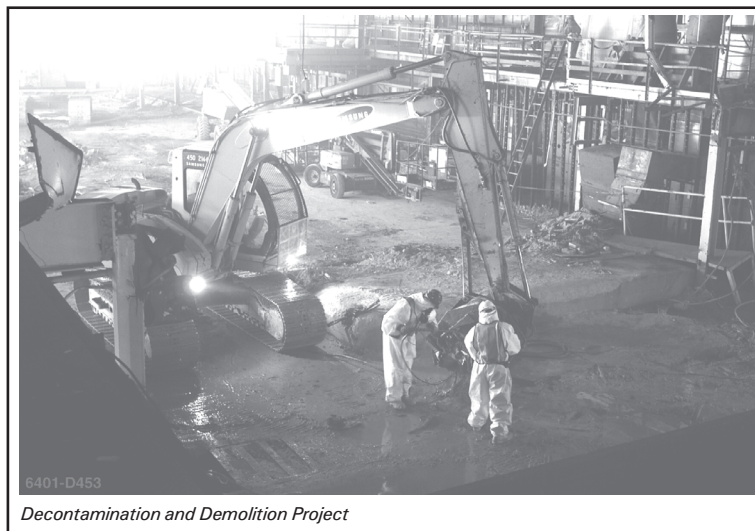
At the on-site disposal facility, waste placement into Cells 1, 2, and 3 continued throughout 2000. Over 227,600 yd³ (174,023 m³) of contaminated soil and debris were placed in the on-site disposal facility during the year. In September of 2000, an important milestone in the Fernald site clean up was achieved when Cell 1 reached 100 percent capacity. Also, following the award of a contract to the Staver Group, construction began on the enhanced permanent leachate transmission system in the summer of 2000. Chapter 3 discusses the activities associated with the monitoring of the on-site disposal facility.

Activities associated with natural resources closely parallel the activities of the Soil and Disposal Facility Project. Chapter 7 discusses specific 2000 natural resources activities.

Decontamination and Demolition Project

The Decontamination and Demolition Project (Operable Unit 3) is responsible for decontamination and dismantling of the above-grade portion of structures and facilities associated with production operations and remedial action facilities. This includes decontamination of facilities, isolation of utilities, demolition of buildings, equipment, and other facilities, and removing uranium and other material from former processing equipment and shipping material and equipment off site. The scope includes the collection and proper management of associated decontamination wastewater.

Facilities Shutdown is part of the Decontamination and Demolition Project, and this project's closure activities during 2000 included the following:



- Isolated the services building (complete)
- Plant 5 ball mill holdup removal (complete)
- 28A electrical isolation (complete)
- 28B electrical isolation (complete)
- Plant 6 removal of holdup material (complete)
- Area 3 utility isolations except the utilities that support 64/65 (complete)
- T-85 isolated for relocation
- Completed removal of sediment from the Nuclear Fuel Services tanks 2E
- Isolated 4B fire water system.

Decontamination and dismantlement activities that took place in 2000 included:

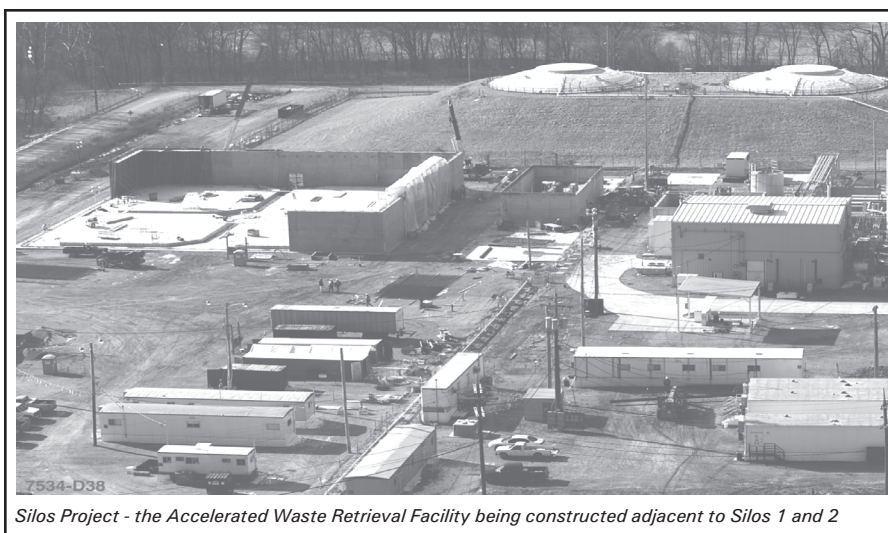
- 28N main gate guard post
- 2E Nuclear Fuel Services storage and pump house
- 28B industrial relations building
- 28A security building
- 20H process water storage tank
- 55B slag recycling pit/elevator
- 55A slag recycling building
- 4B Plant 4 Warehouse
- Plant 6 covered storage area
- 6F Plant 6 salt oil heat treatment building
- 6C electrostatic precipitator south.

Demolition Projects dismantled a total of 13 structures in 2000, bringing the total number of structures demolished at the FEMP to 90.

Silos Projects

The Silos Project (Operable Unit 4) is located on the western edge of the site and includes Silos 1 and 2, also known as the K-65 Silos, Silos 3 and 4, and several nearby structures. Silos 1 and 2 contain low-level radium-bearing residues dating back to the 1950s. Silo 3 contains cold metal oxides, and Silo 4 has never been used. Silos Project remediation activities include the retrieval, stabilization, and off-site disposal of the residues stored in the silos, as well as decontamination and dismantling of the silo structures and associated facilities. A re-evaluation of the remedy for Silos 1 and 2 was completed in 2000, as discussed later in this section.

During 1997 the decision was reached among DOE, EPA, and OEPA to separate the remediation of Silo 3 material from remediation of Silos 1 and 2 material and to re-evaluate the treatment remedies for both materials. In addition, the Silos 1 and 2 Accelerated Waste Retrieval Project was initiated to provide control of radon in Silos 1 and 2 headspace and safe storage of the Silos 1 and 2 material during the interim period until treatment and disposal can be implemented. Following is a summary of each project's major activities during the year.



Silos Project - the Accelerated Waste Retrieval Facility being constructed adjacent to Silos 1 and 2

Silos 1 and 2 Remediation

In 1999, “Proof-of-principle” testing was conducted on four potential treatment processes to provide technical and cost data to support detailed evaluation of potential treatment alternatives. The results of this testing were used to support preparation of a revised Feasibility Study for Silos 1 and 2, documenting the detailed analysis of the alternatives against criteria specified by CERCLA.

The Silos 1 and 2 Draft Feasibility Study/Proposed Plan (DOE 1999b) was submitted to EPA and OEPA for review and approval in December 1999. Based upon the evaluation documented in the Feasibility Study, the Proposed Plan suggested on-site chemical stabilization followed by off site disposal as the revised remedy for Silos 1 and 2 material. EPA approved the revised Feasibility Study/Proposed Plan for Silos 1 and 2 on March 22, 2000 (DOE 2000f), and the Proposed Plan was then issued for a formal public comment period from April 3 through May 15, 2000. Public hearings were conducted in the vicinity of both the FEMP and the Nevada Test Site during this comment period. Responses to all comments received during the comment period were documented in a Responsiveness Summary that was included in the Record of Decision Amendment for Operable Unit 4 Silos 1 and 2 Remedial Actions. On July 13, 2000, EPA approved the Record of Decision Amendment, which documents the final revised remedy for treatment of Silos 1 and 2 material. The final revised remedy consists of on-site chemical stabilization of the Silos 1 and 2 material followed by off site disposal at the Nevada Test Site. Design of the necessary facilities for implementation of the revised remedy for Silos 1 and 2 will be initiated in 2001.

The Silos 1 and 2 Project initiated the Accelerated Waste Retrieval Project in 1998. The purpose of this project is to address the increasing radon concentrations in the Silos 1 and 2 headspace, issues with silo integrity, and heterogeneity of the material for the final treatment facility. The project scope includes design, construction, testing, and operation of interim storage facilities to hold the Silos 1 and 2 material until treatment is implemented. The project also includes design, construction, and startup of a radon control system to provide control of radon emissions during construction and operation phases of the Accelerated Waste Retrieval Project, as well as during interim storage and operation of the Silos 1 and 2 full-scale treatment facility. A contract for implementation of the Silos 1 and 2 Accelerated Waste Retrieval Project was awarded to Foster Wheeler Environmental Corporation in 1999. During 2000 design of the necessary equipment and facilities, and initial construction activities took place. Final design will be completed in early 2001. Construction of the radon control system, the transfer tank area, and the full-scale mockup system will take place during 2001.

Silo 3 Project

A contract for the Silo 3 stabilization/solidification facility was awarded to Rocky Mountain Remediation Services in December 1998. Design of the facility, and initial construction activities took place during 2000. Primary construction activities during 2000 consisted of site preparation and grading, installation of the foundations for the retrieval gantry, and installation of the interim storage area pad. During late 2000, Fluor Fernald’s contract with Rocky Mountain Remedial Services was terminated by agreement of both parties. Evaluation of alternatives for implementation of Silo 3 remediation was initiated and a revised path forward will be developed with input from DOE, regulators, and FEMP stakeholders during 2001.

Supplemental Environmental Projects

As a result of missed Operable Unit 4 enforceable milestones in 1996, the dispute resolution agreement with EPA required DOE to perform the following supplemental environmental projects:

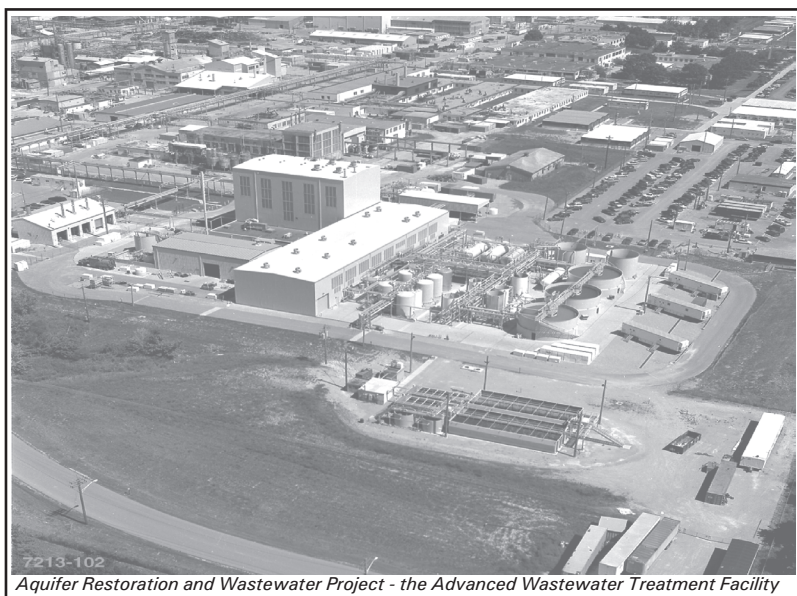
- Grants for ecological restoration research
- Creation of a wild bird/wildflower habitat area
- Railroad track recycling
- Structural steel debris recycling.

Originally this dispute resolution agreement also called for the establishment of a conservation area near the FEMP, however this project could not be finalized. Funds identified for the conservation area were instead directed to the recycling projects.

These supplemental environmental projects are being performed under the scopes of other projects. The wild bird/wildflower habitat area and recycling projects are now complete. Chapter 7 reports the progress on the ecological restoration research in 2000.

Aquifer Restoration and Wastewater Project

The Aquifer Restoration and Wastewater Project (Operable Unit 5) is responsible for the restoration of water quality in the affected portions of the Great Miami Aquifer and treating the FEMP's extracted groundwater, storm water, sanitary wastewater, and remediation wastewater. These activities include the design, construction, operation, monitoring, and reporting for the groundwater restoration and wastewater treatment systems at the FEMP. This project is also responsible for managing the on-site disposal facility's leachate and leak detection monitoring program, as well as operation, maintenance and monitoring of the leachate transmission system.



Aquifer Restoration and Wastewater Project - the Advanced Wastewater Treatment Facility

In 2000 the Aquifer Restoration and Wastewater Project continued to operate the South Plume Module (including the South Plume Optimization Module), the South Field (Phase I) Extraction Module, and the Re-Injection Module. Direct push sampling activities were conducted with a Geoprobe® in the South Field, the waste storage area, and the Plant 6 area. The South Field activities support the groundwater remedy performance monitoring and design of the South Field Phase II Modules, while the waste storage area and Plant 6 area activities support the design of the planned aquifer restoration modules for those areas.

In 2000 a total of 1,879 million gallons (7,112 million liters) of groundwater were extracted from the Great Miami Aquifer, 845 pounds (384 kg) of uranium were removed from the aquifer, and 299 million gallons (1,132 million liters) of water were re-injected into the aquifer. Chapter 3 discusses groundwater monitoring.

Phases 1 and 2 of the advanced wastewater treatment facility and the interim advanced wastewater treatment facility provide final treatment of FEMP contaminated storm water and wastewater. The advanced wastewater treatment facility Phase 3 and the South Plume interim treatment facility are dedicated to treatment of contaminated groundwater associated with FEMP groundwater remediation. In 2000 the following improvements to the site's wastewater storage, conveyance, and treatment systems were made:

- Modified the method of operating the Storm Water Retention Basin to maximize the hydraulic capacity by continuously treating low flows (continuous treatment versus batch treatment)
- Continued to refine the ion exchange resin regeneration system operation
- Changed from the use of caustic (sodium hydroxide) to lime (calcium carbonate) in the operation of the advanced wastewater treatment facility slurry de-watering facility to optimize performance
- Began the construction of the enhanced permanent leachate transmission system for the on-site disposal facility
- Began construction of the alternative remedial action subcontractor approach Basin Re-Route Project that will provide the ability to route storm water from the waste pit area to the Storm Water Retention Basin.

Summary of Compliance with Other Requirements

CERCLA requires compliance with other laws and regulations as part of remediation of the FEMP. These other requirements are referred to as applicable or relevant and appropriate requirements, or ARARs. ARARs that are pertinent to remediation of the site are specified in the record of decision for each operable unit. This section highlights some of the major requirements related to environmental monitoring and waste management and how the FEMP complied with these requirements in 2000.

The regulations discussed in this section have been identified as ARARs within the FEMP's records of decision. The FEMP must comply with these regulations while site remediation under CERCLA is underway; EPA and OEPA enforce compliance. Some of these requirements include permits for controlled releases, which are also discussed in this section.

Resource Conservation and Recovery Act (RCRA)

RCRA, as amended, regulates treatment, storage, and disposal of hazardous waste and the hazardous part of mixed waste (mixed waste contains both radioactive and hazardous waste components). Hazardous and mixed waste now generated at the site result from such activities as CERCLA remedial actions, laboratory analyses, and maintenance activities. The FEMP also has an inventory of mixed waste generated from former production activities. These wastes are regulated under RCRA and Ohio hazardous waste management regulations; thus, the site must comply with legal requirements for managing hazardous and mixed wastes. OEPA has been authorized by EPA to enforce its hazardous waste management regulations in lieu of the federal RCRA program. In addition, hazardous waste management is subject to the 1988 Consent Decree and the first (1993) and second (1998) Stipulated Amendment entered into between the State of Ohio and DOE, as well as a series of Director's Final Findings and Orders issued by OEPA.

The FEMP completed several administrative activities related to mixed waste storage and treatment during 2000, including:

- Submittal of the 1999 RCRA Annual Report (DOE 2000c), which describes hazardous waste activities for 1999
- Revisions to several sections of the RCRA Part A and B permit application
- Submittal of the Fiscal Year 2000 Annual Update to the Site Treatment Plan (DOE 2000g) as required in the 1992 Federal Facility Compliance Act and the implementing Director's Findings and Orders issued by OEPA in October 1995.

Additional details on projects involving treatment of mixed wastes are provided in the Mixed Waste Treatment subsection.

RCRA Property Boundary Groundwater Monitoring

The Director's Findings and Orders, which were signed September 10, 1993, described an alternate groundwater monitoring system. This document was revised during 2000 and approved on September 7, 2000, to coincide with the groundwater monitoring strategy identified in the IEMP. This is discussed in Chapter 3 and is called Property Boundary Monitoring.

RCRA Closures

The first (1993) Stipulated Amendment to Consent Decree required that DOE identify all hazardous waste management units at the site. As a result, burners, incinerators, furnaces, stills, process equipment, tank units, dust collectors, and other potential waste containment units were evaluated in the early 1990s to determine if they were hazardous waste management units or solid waste management units. This evaluation was completed in 1994. In 1996 OEPA issued a Director's Findings and Orders to integrate RCRA closure requirements with CERCLA response actions for FEMP hazardous waste management units. In 2000 the FEMP completed the remediation of two hazardous waste management units under the integrated RCRA/CERCLA process: the sludge drying beds located at the former sewage treatment plant and the uranyl nitrate hexahydrate tanks in the Nuclear Fuel Services storage area. Plans were developed for the remediation of a third unit, a storage pad located north of Plant 6.

Thorium Management

A thorium management strategy and a schedule to complete RCRA determinations of thorium materials and to improve the storage of thorium materials at the FEMP were developed as part of the Stipulated Amendment to the Consent Decree signed in 1991. This strategy is based on three primary objectives:

- To maintain environmentally stable interim storage of the thorium inventory while minimizing personnel radiation exposure
- To implement actions required to complete RCRA evaluations of the thorium materials
- To implement long-term storage and disposal alternatives.

The Thorium Overpacking Project, in which the FEMP removed 3,400 containers of thorium material and shipped 10,875 drum-equivalents, or 80,480 ft³ (2,279 m³), of thorium material to the Nevada Test Site for disposal, was completed in 1997. The characterization documentation and formal RCRA waste determinations for the remaining estimated 8,500 containers of thorium legacy waste continued in 1999. In 2000 over 6,000 of these containers were shipped to Nevada Test Site for disposal. The following activities are planned for the future:

- Low-level radioactive, non-RCRA thorium legacy waste will continue to be prepared and shipped to the Nevada Test Site for disposal.
- The thorium legacy waste determined to be hazardous under RCRA will be prepared and shipped for treatment to meet land disposal restrictions and, upon analytical confirmation, will be shipped from the treatment facility to an approved disposal facility.
- Non-RCRA thorium waste that contains free liquids and hydrogen-generating waste will require treatment and repackaging to meet Nevada Test Site waste acceptance criteria and will then be shipped to the Nevada Test Site for disposal.

The treatment activities for thorium legacy waste are planned for completion by December 31, 2002.

Mixed Waste Treatment

The FEMP stores mixed wastes that are subject to RCRA land disposal restrictions. These restrictions currently prohibit the storage of certain hazardous waste streams for longer than one year, unless OEPA approves an extension.

Mixed waste is defined under RCRA as waste containing both a hazardous waste subject to RCRA, and a source, special nuclear, or radioactive byproduct material subject to the Atomic Energy Act, as amended. RCRA mixed wastes at the FEMP are stored in consolidation tanks until they are shipped to the incinerator at Oak Ridge, Tennessee. The consolidation tanks at the FEMP hold approximately 20,000 gallons of material, which constitutes a "batch". Batches may contain oils, solvents or a combination of the two.

Depending on how liquid mixed wastes are classified under RCRA, they are reported either as liquids or as solids.

The 1992 amendment to RCRA, the Federal Facility Compliance Act, provided DOE with an exemption from enforcement under the land disposal restrictions storage prohibition; as long as DOE sites complied with the plans and schedules for mixed waste treatment, as identified in the Site Treatment Plan and the implementing Director's Findings and Orders issued by OEPA on October 4, 1995. The FEMP submitted the first Site Treatment Plan Annual Update to OEPA in December 1996. These updates are due by December 31 each calendar year. Since then, four additional annual updates have been submitted. The annual update describes the status of mixed waste treatment projects developed under the Site Treatment Plan. It also adds newly generated/newly identified mixed waste streams, and certifies that the FEMP met all regulatory milestone dates for the treatment of mixed wastes identified in the plan and in the implementing Director's Findings and Orders.

In 2000, 18,102 gallons (68,516 liters) of liquid mixed waste were bulked into batch 10 storage tanks, and 50 gallons (190 liters) of liquid mixed waste were bulked into batch 11 storage tanks. The following mixed wastes were shipped during 2000:

- 14,947 gallons (56,574 liters) of liquid mixed waste from batch 9 were shipped to the K-25 Toxic Substances Control Act Incinerator in Oak Ridge, Tennessee.
- 2,034 ft³ (58 m³) of below-treatment-standard mixed waste was shipped to Envirocare of Utah, Inc. for disposal.
- 2,636 ft³ (75 m³) of mixed waste soils from the fire training facility, which met the waste acceptance criteria, were disposed at the on-site disposal facility.
- 3,267 ft³ (93 m³; under specific Waste Generator Services treatment campaigns) of liquid aqueous low level radioactive and mixed wastes meeting National Pollutant Discharge Elimination System (NPDES) Permit requirements were treated at the advanced wastewater treatment facility.

The following hazardous/recyclable wastes were shipped to approved recycle centers and/or treatment facilities in 2000:

- 1,152 ft³ (33 m³) of lead acid batteries
- 237 ft³ (7 m³) of lab packs
- 788 ft³ (22 m³) of electrical waste (fluorescent light tubes)
- 21 ft³ (less than 1 m³) of photographic waste
- 247 ft³ (7 m³) of water treatment chemicals
- 1,134 ft³ (32 m³) of asbestos
- 3,750 ft³ (106 m³) of used rubber tires.

Clean Water Act

Under the Clean Water Act, as amended, the FEMP is governed by NPDES regulations that require the control of discharges of non-radiological pollutants to waters of the State of Ohio. The NPDES Permit, issued by the State of Ohio, specifies discharge and sample locations, sampling and reporting schedules, and discharge limitations. The FEMP submits monthly reports on NPDES activities to OEPA.

OEPA issued a new NPDES Permit, Permit No. 11O00004*FD on January 28, 2000, which became effective on March 1, 2000. Therefore, NPDES reporting for 2000 reflects those requirements of the old NPDES Permit (11O00004*ED) from January 1, 2000 through February 28, 2000, and the requirements under the new permit from March 1, 2000 through December 31, 2000. Chapter 4 discusses the surface water and treated effluent information in detail.

Clean Air Act

NESHAP Subpart H imposes a limit of 10 millirem (mrem) per year on the effective dose equivalent to the maximally exposed individual as a result of all air emissions (with the exception of radon) from the facility in a single year. For 2000 the FEMP was in compliance with the NESHAP dose limit, as determined by ambient air monitoring at the FEMP fence line boundary.

EPA regulates the FEMP's radionuclide emission sources through the NESHAP; OEPA has authority to enforce the State of Ohio's air standards including particulate, chemical, and toxic emission sources. In 2000 the FEMP complied with all emissions standards, as discussed in Chapter 5. The NESHAP Annual Report for 2000 is included as Appendix D.

Several remediation activities, including the waste pits remediation, decontamination and dismantling, soil excavation, and on-site disposal facility construction and waste placement, may result in the generation of fugitive dust, which is also regulated by OEPA. Compliance is accomplished by implementing the Fugitive Dust Control Policy negotiated between DOE and OEPA in 1997. This policy is implemented in the Best Available Technology Determination for Remedial Construction Activities on the Fernald Environmental Management Project (DOE 1997b), the requirements of which are incorporated into each operable unit's remedial design and remedial action deliverables. The policy allows for visual observation of fugitive dust and implementation of dust control measures to determine compliance during remediation activities.

Superfund Amendments and Reauthorization Act of 1986

The Superfund Amendments and Reauthorization Act of 1986 (SARA) amended CERCLA and was enacted, in part, to clarify and expand CERCLA "Superfund" requirements. SARA Title III is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA). SARA Title III, Section 312, Emergency and Hazardous Chemical Inventory Report (DOE 2000e) for 2000 was submitted to OEPA and other local emergency planning/response organizations in February 2001. The report lists the amount and location of hazardous chemicals/substances stored or used in amounts greater than the minimum reporting threshold at any time during the previous year.

The SARA Title III, Section 313, Toxic Chemical Release Inventory Report will be submitted, as required, to OEPA and EPA before July 1, 2001. This report, called Form R, is required if the FEMP meets certain criteria and an applicable threshold for any SARA 313 chemical is reached.

The Toxic Chemical Release Inventory Report lists routine and accidental releases, as well as information about the activities, uses, and waste for each reported toxic chemical. For 2000 an evaluation is currently underway to determine if the FEMP has any chemicals that meet the SARA 313 manufactured, processed, or otherwise used reporting threshold requirements. The regulatory reporting threshold has changed for several chemicals; thus, a thorough review of chemicals at the FEMP will be conducted. The evaluation will be completed in June of 2001, and will be reported prior to the July 1, 2001 compliance date.

Any off-site release meeting or exceeding a reportable quantity as defined by SARA Title III, Section 304, requires immediate notifications to local emergency planning committees and the state emergency response commission. Depending on the respective requirements, notifications are made to the National Response Center and to the appropriate federal, state, and local regulatory entities. All releases occurring at the FEMP are evaluated and documented to ensure that proper notifications are made in accordance with SARA. In addition to SARA, releases are also evaluated for notification under CERCLA Section 103, RCRA, the Toxic Substances Control Act, the Clean Air Act, the Clean Water Act, and Ohio environmental laws and regulations. In 2000 no releases occurred at the FEMP that required reporting to regulatory or other agencies, under any of the above regulations. Table 2-3 summarizes the FEMP's compliance with SARA Title III (i.e., EPCRA) reporting requirements during 2000.

TABLE 2-3
SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT, TITLE III
(EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT)
COMPLIANCE REPORTING, 2000^a

Sections of the Act	Yes	No	Not Required
302-303: Planning notification	X		
304: Extremely hazardous substances release notification			X
311-312: Material safety data sheet/chemical inventory	X		
313: Toxic chemical release inventory reporting (for calendar year 1999)	X		

^a"Yes" indicates that notifications were provided and/or reports were issued under the applicable provisions. "No" indicates that notifications or reports should have been provided but were not. "Not required" indicates that no actions were required under the applicable provisions, either because triggering thresholds were not exceeded or no releases occurred.

Other Environmental Regulations

The FEMP is also required to comply with other environmental laws and regulations in addition to those described above. Table 2-4 summarizes compliance with each of these requirements for 2000.

TABLE 2-4
COMPLIANCE WITH OTHER ENVIRONMENTAL REGULATIONS

Regulation and Purpose	Background Compliance Issues	2000 Compliance Activities
Toxic Substances Control Act (TSCA) Regulates the manufacturing, use, storage, and disposal of toxic materials, including polychlorinated biphenyl (PCBs) and PCB items	The last routine TSCA inspection of the FEMP's program was conducted by EPA Region V on September 21, 1994. No violations of PCB regulations were identified during the inspection.	Non-radiologically contaminated PCBs and PCB items were shipped to TSCA-approved commercial disposal facilities for incineration on an "as-needed basis". Radiologically contaminated PCB liquids were bulked for later shipment to the TSCA permitted DOE incinerator in Oak Ridge, TN. Most radiologically contaminated PCB solids currently had no treatment or disposal options and remain in storage on site.
Ohio Solid Waste Act Regulates infectious waste	The FEMP was registered with OEPA as a generator of infectious waste (generating more than 50 pounds [23 kg] per month) until December 6, 1999, when OEPA concurred with the FEMP's qualification as a small quantity generator.	All infectious wastes generated in the medical department were transported to a licensed treatment facility for incineration.
Federal Insecticide, Fungicide, and Rodenticide Act Regulate the registration, storage, labeling, and use of pesticides (such as insecticides, herbicides, and rodenticides)	The last inspection of the Federal Insecticide, Fungicide, and Rodenticide Act program conducted by EPA Region V on September 21, 1994, found the FEMP to be in full compliance with the requirements mandated by Federal Insecticide, Fungicide, and Rodenticide Act.	An inappropriate application of the pesticide diazinon took place in June of 2000 within the Area 1, Phase I wetland. This was reported to the EPA and OEPA, and measures have been taken to prevent a reoccurrence. All other pesticide applications at the FEMP were conducted according to Federal and State regulatory requirements.
National Environmental Policy Act (NEPA) Requires the evaluation of environmental, socio-economic, and cultural impacts before any action, such as a construction or cleanup project, is initiated by a federal agency	An environmental assessment for proposed final land use was issued for public review in 1998. It was prepared under DOE's guidelines for implementation of NEPA, 10 Code of Federal Regulations 1021. It also addresses previous DOE commitments to consult with the public prior to any decisions on land use.	No NEPA activities were conducted in 2000.
Endangered Species Act Requires the protection of any threatened or endangered species found at the site as well as any critical habitat that is essential for the species' existence	Ecological surveys conducted by Miami University and DOE, in consultation with the Ohio Department of Natural Resources and U.S. Fish and Wildlife Service, have established the following list of threatened and endangered species and their habitats existing on site: Cave salamander, state-listed endangered -- marginal habitat, none found; Sloan's crayfish, state-listed threatened -- found on northern sections of Paddys Run; Indiana brown bat, federally listed endangered -- species found in riparian areas along Paddys Run.	No surveys were conducted in 2000.

**TABLE 2-4
(Continued)**

Regulation and Purpose	Background Compliance Issues	2000 Compliance Activities
Floodplains/ Wetlands Review Requirements		
DOE regulations require a floodplain/wetland assessment for DOE construction and improvement projects.	A wetlands delineation of the FEMP, completed in 1992 and approved by the U.S. Army Corps of Engineers in August 1993, identified 36 acres (15 hectares) of freshwater wetland on the FEMP property. Updated delineations are conducted approximately every five years.	No assessments were performed in 2000.
National Historic Preservation Act		
Mandates protection of historic and prehistoric cultural resources	The FEMP is within an area rich in historic and prehistoric cultural resources. These cultural resources include 148 prehistoric sites within 1.24 miles (2 km) of the FEMP and 40 historic sites.	Activities were conducted to avoid and address impacts to cultural resources (refer to Chapter 7).
Native American Graves Protection and Repatriation Act		
Requires the identification and preservation of cultural resources on federal lands, and consultation with Native American Tribes on removal and management of inadvertently discovered Native American cultural items	Historical remains and artifacts were discovered during a 1994 construction project. The Native American remains which included an adolescent boy and his dog were discovered during installation of pipelines for the Public Water Supply project. Partial remains of approximately 20 more people and numerous artifacts were also found.	No Native American remains were discovered or interred in 2000. Cultural resources were identified as a result of surveys performed (refer to Chapter 7).
Natural Resource Requirements Under CERCLA and Executive Order 12580		
Requires DOE to act as a Trustee (i.e., guardian) for natural resources at its federal facilities.	DOE and the other Trustees, which include U.S. Department of the Interior, U.S. Fish and Wildlife Service, OEPA, Ohio Attorney General's Office, and EPA, meet regularly to discuss potential impact to natural resources and to coordinate Trustee activities. The Trustees also interact with the Fernald Citizens Advisory Board and Community Reuse Organization.	The Trustees and stakeholders continued to discuss the scope of Natural Resource Restoration activities at the FEMP, and the integration of public use and long-term stewardship at the FEMP.

Other Permits

Permits are the means by which some environmental laws are implemented. The FEMP has permits for controlled releases to surface water and air. The FEMP's permit for discharging water under the NPDES regulations is discussed in the Clean Water Act section of this chapter. The active Permits to Install remaining for the FEMP wastewater treatment system include those for the Storm Water Retention Basin and Bio-Surge Lagoon. Permits to Install govern the installation (and to a lesser degree, the operation) of specific wastewater treatment and control devices.

The FEMP has 10 current air Permits to Operate and five associated Permits to Install. These permits cover boilers, diesel storage tanks, clothes dryers, the respirator washing facility, maintenance shop facilities, a laboratory hood system, and a gasoline dispensing facility. EPA and OEPA approve other air emission sources and wastewater systems related to remedial activities through the review and approval of CERCLA remedial design packages or CERCLA-allowed permit information summaries.

Site-Specific Regulatory Agreements

Federal Facility Compliance Agreement

In July 1986 DOE entered into a Federal Facility Compliance Agreement (FFCA) with the EPA, which requires the FEMP to:

- Maintain a continuous sample collection program for radiological constituents at the FEMP's treated effluent discharge points and report the results quarterly to EPA, OEPA, and the Ohio Department of Health. The sampling program to address this requirement has been modified over the years and is currently governed by an agreement reached with EPA and OEPA that became effective May 1, 1996. This agreement requires sampling at the Parshall Flume (PF 4001) and the Storm Water Retention Basin spillway for radiological constituents. These data are reported through quarterly and annual reports (refer to Appendix B of this report) under the IEMP.
- Maintain a sampling program for daily flow and total uranium at the South Plume extraction wells and report the results quarterly to EPA, OEPA, and Ohio Department of Health. The sampling program conducted to address this requirement has also been modified over the years and is currently governed by the agreement reached with EPA and OEPA on May 1, 1996.

Federal Facility Agreement, Control and Abatement of Radon-222 Emissions

The Federal Facility Agreement (FFA) between DOE and EPA, signed on November 19, 1991, ensures that DOE takes all necessary actions to control and abate radon-222 emissions at the FEMP, under the authority of 40 Code of Federal Regulations 61, Subpart Q. This agreement acknowledges that Silos 1 and 2 exceed the radon flux rate of 20 picoCuries per square meter per second ($\text{pCi}/\text{m}^2/\text{sec}$), but allowed the FEMP to address this exceedance by implementing a removal action (installation of a bentonite cap in 1991) to bring radon emissions from the silos to a level as low as reasonably achievable (ALARA), and to attain the NESHAP Subpart Q standard upon completion of final remediation. The FFA also requires demonstration of compliance with the Subpart Q standard (upon completion of remedial actions) for the waste pits, clearwell, and any other sources found to emit radon in excess of 20 $\text{pCi}/\text{m}^2/\text{sec}$. Chapter 5 further discusses the results of the FEMP Radon Monitoring Program for 2000.

As Low As Reasonably Achievable

The ALARA process ensures the selection of the optimum physical design features and administrative controls, which will eliminate, control, or mitigate radiological exposure of general employees, the public, and the environment with respect to what is reasonably achievable.

Split/Co-Located Sampling Program

In 2000 DOE and OEPA cooperated in a program in which samples of groundwater, surface water, and sediment, were “split” and sent to different analytical laboratories, or “co-located,” meaning samples were collected from the same location but at different times. Split samples are obtained when technicians alternately add portions of a sample to two individual sample containers. This collection method helps ensure that both samples are as identical as possible. Split samples are then submitted to two independent laboratories for analysis. The FEMP has participated in this program with the state since 1987.

This program allows for an independent comparison of data to ascertain laboratory analysis and field quality assurance. The data from the split/co-located sampling program show reasonable agreement between DOE and OEPA results for groundwater, surface water, and sediment samples. The slight differences in DOE and OEPA sample results presented for 2000 do not impact the FEMP’s compliance with federal or state regulations. The detailed results for the 2000 split/co-located samples are presented in Appendix E of this report.

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